Final Project: 8D Report

組別：H
B10901088 李竹勛
B10901151 林祐群

I. Problem outlook

A. Scenario:

Since 2022, your company's monthly shipment volume has been 100,000 units, maintaining a high-quality standard. In August and September of this year, three defective units were discovered during characteristic inspections after assembly at Bravo's customer factory, all exhibiting the same defect pattern. Bravo sent a complaint email to your company requesting that you halt the delivery of this defective batch and provide an equivalent number of replacement parts. Subsequently, two additional defects were found while testing complete vehicles produced by an automotive manufacturer (OEM). The defect patterns appear to be the same as the three identified by Bravo; however, based on delivery timelines, it is more likely that this batch is different from the one identified by Bravo. This is a critical situation. If no countermeasures are taken, significant problems may arise; therefore, your company clearly needs to take immediate action to contain and resolve the issue.

B. Task:

Please create a flowchart for handling this customer complaint and write a complete 8D report. Pay attention to supply chain relationships, key points of the eight steps, logic, and readability. Within the reasonable scope of the scenario, you may simulate any people/things/events you wish to express (e.g., team members, locations where issues occurred, solutions, etc.).

情境: 自2022年以來，您公司的產品每月出貨量為 10 萬件，出貨品質保持在相當高的水準。
今年8/9 Bravo客戶工廠於組裝後進行特性檢驗時，發現了3件缺陷，且這3件缺陷模式相同。Bravo發了客訴郵件給您的公司，要求貴公司停止交付此缺陷批次，並交付等量的替換零件。
隨後，一家汽車製造商（OEM）生產的整車測試中又發現了2件缺陷。缺陷模式看來與客戶Bravo發現的3件相同，但根據交貨期推斷，該批次與Bravo發現批次不同的可能性更高。
這是一個危急的情況。如果不採取對策，可能會出現巨大的問題，因此貴公司顯然需要立即採取行動來遏制和解決問題。
題目: 請繪製出此客訴處理流程圖及撰寫一份完整的8D報告。注意供應鏈的關係、8個步驟的要點、邏輯性及可讀性。於情境的合理範圍內，可以任意模擬出想表達的人/事/物 (e.g. 團隊成員、問題發生地點、解決方案 …etc.)

II. 8D Process

A. D1: Establish the Team

We assemble a cross-functional team containing mixed expertise and knowledge to address the problem. Maria Huang, the quality manager, is assigned as the team leader to organize the team and ensure it is going in the right direction. Various engineers provide specialized knowledge of product design, manufacturing, supply chain, and testing. Kelly Wong, a customer service representative, communicates between the team and affected customers.

1. Team Composition

Title	Name	Description
Quality Manager	Maria Huang (Team Leader)	Responsible for overall investigation and report coordination
Design Engineering Representative	Alex Chen	Technical analysis of potential design-related root causes
Manufacturing Process Engineer	Sarah Kim	Process and production investigation
Supply Chain Specialist	Emily Tan	Traceability and batch tracking
Test and Validation Engineer	David Lin	Defect verification and characterization
Customer Liaison	Kelly Wong	External communication and customer relationship management

2. Team Objective

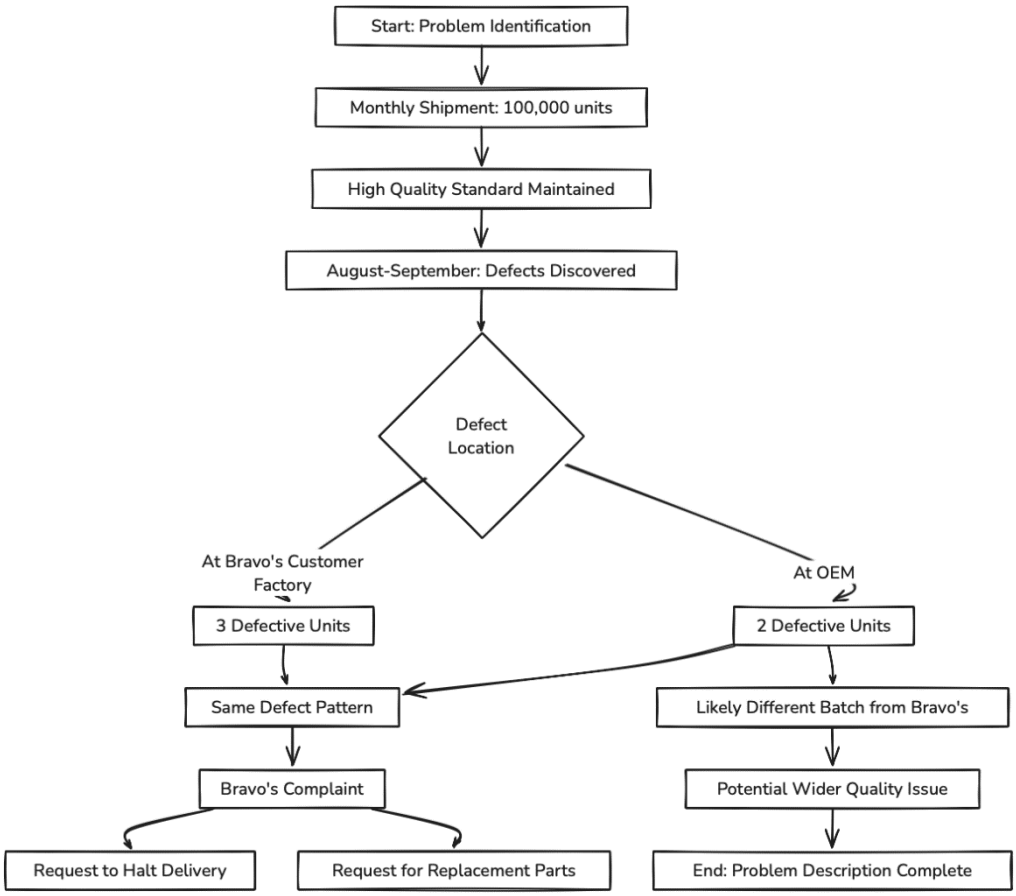
Comprehensive investigation and resolution of the product defect affecting customer Bravo and Totoya.

B. D2: Describe the Problem

In August and September of this year, three defective units were discovered during characteristic inspections after assembly at Bravo's customer factory, all exhibiting the same defect pattern. Two additional defects were later found while testing complete vehicles produced by Totoya. The defect patterns are the same as the three identified before.

	Case 1	Case 2
Who found it	Bravo	Totoya
What problem	Defect #13, same pattern	
What is the affected batch	#2208-A	#2209-B
Where did it happen	Bravo's factory	Totoya vehicle testing
When did it happen	Aug., Sep. 2024	later
How many	3 units	2 units

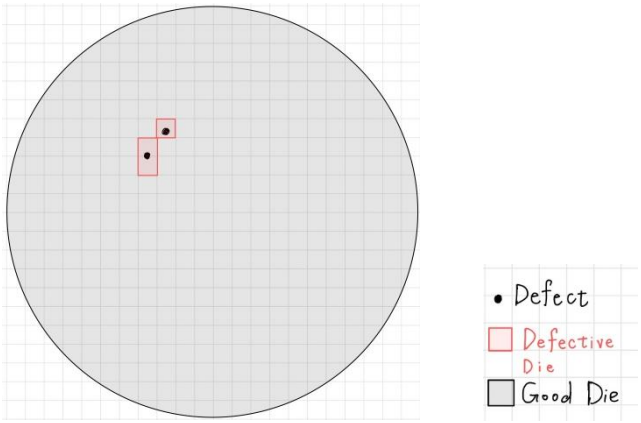
1. Flow Chart



2. Lot traceability records

Defect Number	Data Code	Shipping Data from RTK	Shipping Data from Distributor	Wafer (Lot) Number	Die Location (x, y)	Package Lot Number	Lead Frame Strip No.	Lead Frame Strip Location (x, y)
1	DC-2208	RTK-001-Aug	DIST-105-Sep	W1234 (WLN-22081)	(23,45)	PLN-082022-01	LFS-001	(5,10)
2	DC-2208	RTK-001-Aug	DIST-105-Sep	W1234 (WLN-22081)	(25,47)	PLN-082022-01	LFS-001	(6,12)
3	DC-2208	RTK-002-Sep	DIST-106-Sep	W2234 (WLN-22085)	(12,18)	PLN-092022-02	LFS-002	(7,14)
4	DC-2209	RTK-003-Sep	DIST-107-Oct	W3346 (WLN-22082)	(34,56)	PLN-092022-03	LFS-003	(9,17)
5	DC-2209	RTK-003-Sep	DIST-107-Oct	W3346 (WLN-22082)	(36,58)	PLN-092022-03	LFS-003	(10,19)

3. Initial defect inspection reports



Initial defect inspection reports	
Defect Identification	Three defects identified by Bravo. Two additional defects were found during Totoya vehicle testing.
Defect Pattern Description	Consistent defect pattern across all five defective units, observed as Defect #13.
Inspection Date	Bravo: August & September 2024; Totoya: September 2024.
Batch/ Lot Number	Bravo: Lot #2208-A; Totoya: Lot #2209-B.
Inspection Methodology	Visual inspection, characteristic measurements, functional tests.
Defect Rate	Bravo: 3/10,000 units in Lot #2208-A; Totoya: 2/10,000 units in Lot #2209-B.
Key Findings	- Defects localized to specific coordinates within the die.
	- Similar defect patterns across all five samples.
	- No anomalies found in outgoing quality control (OQC) records.

C. D3: Implement and Verify Containment Actions

We perform the following immediate containment measures to isolate the problem from customers.

i. Production Halt:
- Immediate cessation of shipments for potentially affected lot numbers
- Quarantine of remaining inventory from suspect production batches

ii. Customer Communication:
- Notify Bravo and Totoya of immediate investigation
- Commit to providing replacement parts
- Establish daily status update protocol

iii. Lot Traceability:
(D2: Lot traceability check)
- Comprehensive trace-back of affected production lots
- Identify precise manufacturing the date, shift, and production line
- Segregate and isolate potentially impacted inventory

iv. Risk Mitigation:
- Initiate 100% inspection of remaining inventory from suspect production periods
- Prepare replacement parts for customer compensation

Root Cause Hypothesis	- Potential supplier material defect in lead frame or die.
	- Manufacturing parameter drift during wafer assembly.
	- Transportation damage post-OQC.
Containment Actions Taken	- Stopped shipment of all remaining units from Lot #2208-A and Lot #2209-B.
	- Issued recall for defective batches.
	- Conducted additional inspections for all in-stock units and shipments.
Next Steps	- Detailed root cause analysis.
	- Engage with suppliers to evaluate material quality.
	- Enhance testing coverage to detect potential defects in earlier stage.

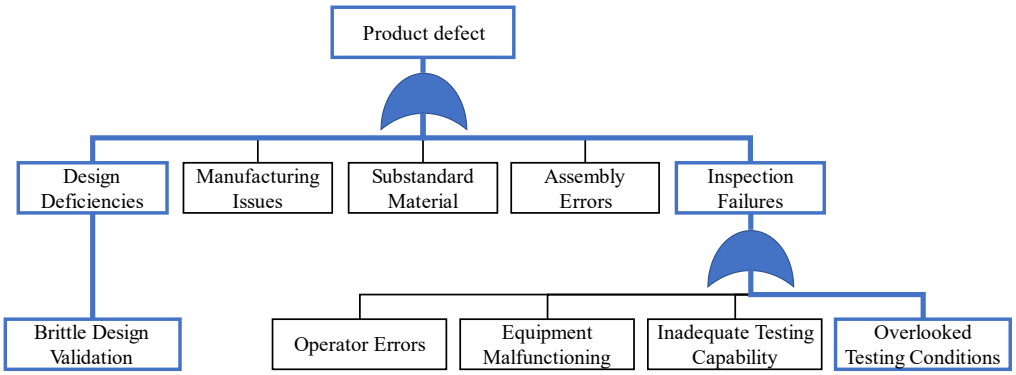
D. D4: Define and Verify Root Causes

We list some possible root causes.

Root Cause Aspect		Root Cause Level	
NC	1. Potential systematic issue in production or assembly 2. Potential inconsistent production or assembly 3. Potential substandard raw material	**TRC**	1. Potential design parameter deviation 2. Manufacturing process variation 3. Component quality from our supplier
		MRC	1. Lack of maintenance schedules or calibration standards 2. Inadequate training or supervision of operators
ND	1. Potential weakness in current in-process quality control 2. Insufficient final test coverage 3. Inadequate statistical process control	**TRC**	1. Test equipment calibration issues
		MRC	1. Weak supplier quality management processes 2. Potential rushed inspections

We use the following tools to analyze potential causes.

1. Fault Tree Analysis

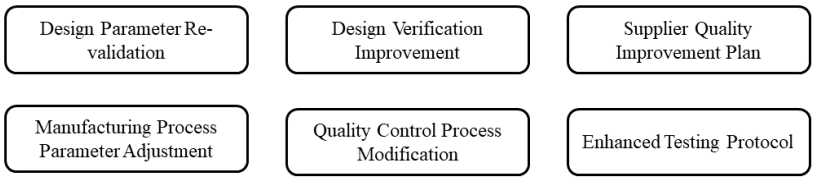


After thorough analysis, inspection, and communication with suppliers, Bravo, and Totoya, the cause was identified at the design stage. We discovered that the unit could fail to operate correctly at a certain temperature threshold. However, the design validation only considers extreme weather conditions and oversees the issue. The testing team is also to be found at fault for incomplete testing conditions.

E. D5: List, Choose and Verify Corrective Actions

We list some potential corrective actions and select correct ones to cover the root causes.

1. Potential Corrective Actions



2. Selected Corrective Actions

- Design verification improvement
    a. Expand design validation scope by including a broader range of real-world conditions.
    b. Perform iterative validations at different design stages, verifying all key parameters (e.g., thermal tolerance, stress resistance).
    c. Develop a checklist of environmental conditions (temperature, humidity, vibration, etc.) based on customer usage data with regular updates.
- Testing protocol enhancement
    a. Ensure testing conditions match actual customer use cases and environmental factors.
    b. Review and update testing protocols regularly to incorporate lessons learned from failures and new customer requirements.
    c. Provide additional training to testing staff on the importance of covering all specified conditions.
    d. Engage third-party testing agencies to provide independent validation of critical tests.

These selected actions cover both root causes; thus, we turn to these two methods for the corrective process. With enhanced design verification, we are able to detect anomaly and ensure the functionality across large scope. Supported with an improved checklist, we measure extra information aggregated from customers' provided data with permission. It will personalize the usage and be engaged in additional verification considerations that better maintain the general quality and that in specific domain.

F. D6: Implement Permanent Corrective Actions

We implement permanent corrective actions based on D5 and verify their effectiveness.

1. Design verification improvement

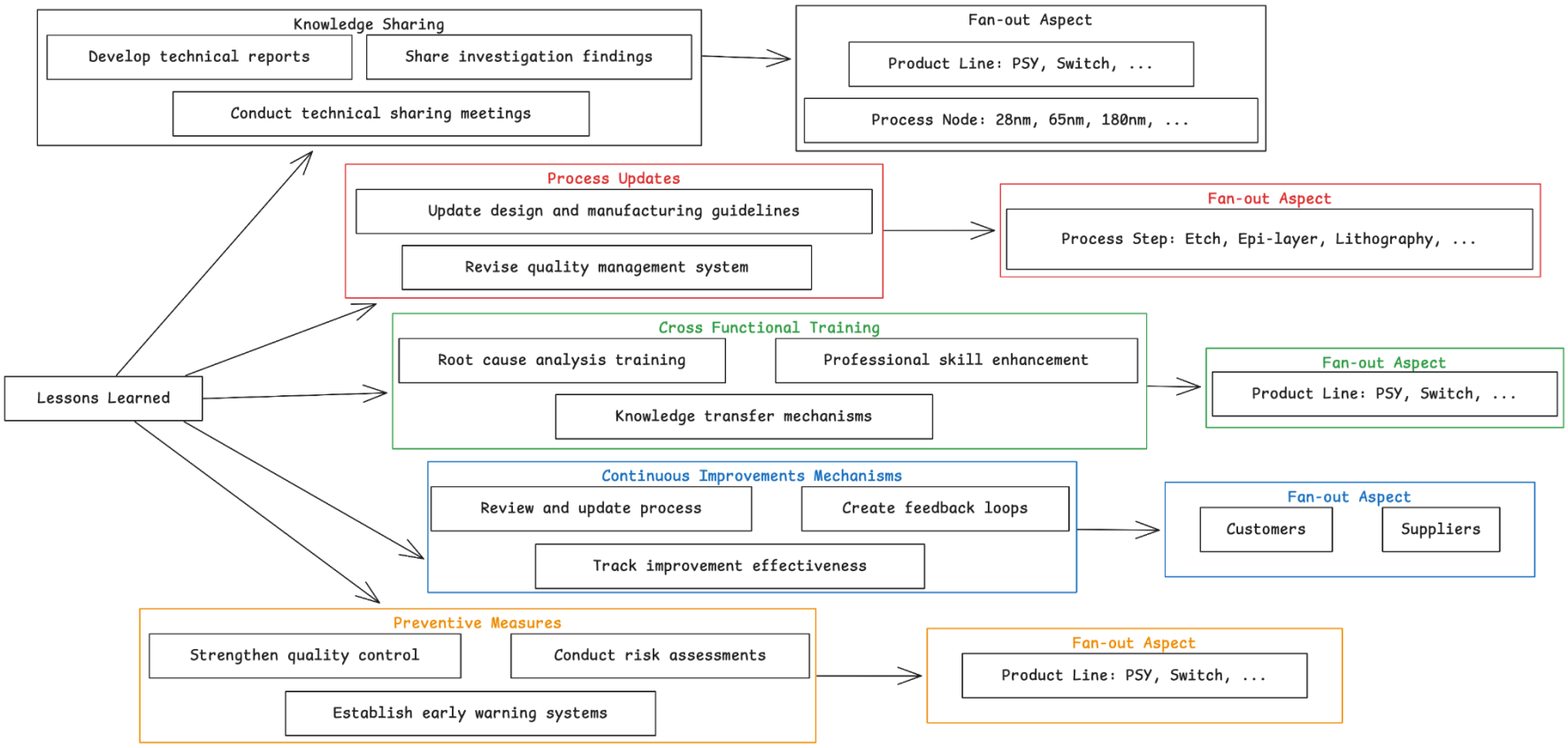
Action	Implementation	Verification
a.	• Include a broader range of real-world conditions and simulate real-world scenarios such as sudden thermal changes and long-term exposure.	• Conduct controlled tests in environmental chambers to verify performance across the expanded range. • Compare test results with baseline performance.
b.	• Integrate validation checkpoints into the design timeline. • Refine the design based on test results at each stage.	• Track design changes and corresponding validation results using a design traceability matrix.
c.	• Collaborate with design, QA, and customer support on the checklist. • Update the checklist quarterly based on customer feedback and field data.	• Conduct a gap analysis to confirm all customer use cases are addressed.

2. Testing protocol enhancement

Action	Implementation	Verification
a.	• Analyze customer feedback and field reports. • Develop real-world simulation tests.	• Compare test results under simulated conditions to field failure reports.
b.	• Establish a testing review committee to assess protocols quarterly.	• Review test coverage reports to confirm all updated conditions are included in the testing plan.
c.	• Organize workshops and training sessions on updated testing methods and the importance of testing completeness.	• Evaluate testing staff through post-training assessments and audits.
d.	• Partner with a certified testing agency to perform independent validation of critical tests.	• Compare third-party test results with internal testing to ensure consistency.

G. D7: Prevent Recurrence

We aim to prevent recurrence of the defect by standardizing improvements, updating processes, and sharing lessons learned across all relevant teams and projects.


Knowledge Sharing
Develop technical reports
Share investigation findings
Conduct technical sharing meetings
Fan-out Aspect
Product Line: PSY, Switch, ...
Process Node: 28nm, 65nm, 180nm, ...
Process Updates
Update design and manufacturing guidelines
Revise quality management system
Fan-out Aspect
Process Step: Etch, Epi-layer, Lithography, ...
Lessons Learned
Cross Functional Training
Root cause analysis training
Professional skill enhancement
Knowledge transfer mechanisms
Fan-out Aspect
Product Line: PSY, Switch, ...
Continuous Improvements Mechanisms
Review and update process
Create feedback loops
Track improvement effectiveness
Fan-out Aspect
Customers
Suppliers
Preventive Measures
Strengthen quality control
Conduct risk assessments
Establish early warning systems
Fan-out Aspect
Product Line: PSY, Switch, ...

Lessons Learned Fan-out Activities:

1. Knowledge Sharing
    - Share investigation findings across similar product lines
    - Conduct technical sharing meetings
    - Develop technical reports
    - Fan-out Aspect:
        - Product Line: PSY, Switch, ...
        - Process Node: 28nm, 65nm, 180nm, ...
2. Process Updates
    - Update design and manufacturing guidelines
    - Revise quality management system
    - Fan-out Aspect:
        - Process Step: Etch, Epi-layer, Lithography, ... (Manufacturing Defects -> Explicit Testing)

3. Cross Functional Training
    - Root cause analysis training
    - Professional skill enhancement
    - Knowledge transfer mechanisms
    - Fan-out Aspect:
        - Product Line: PSY, Switch, ...

4. Continuous improvement mechanisms

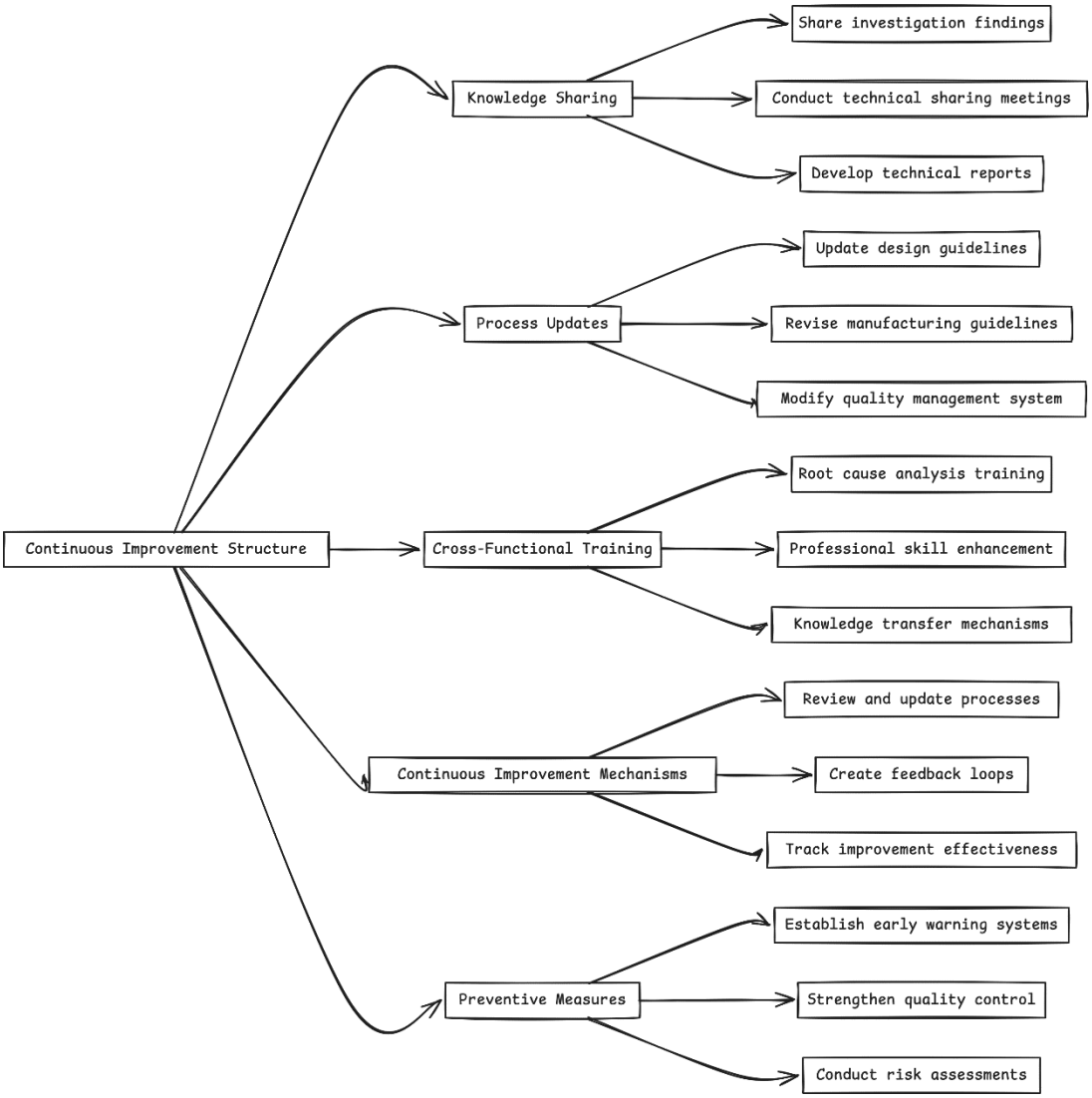
    - Review and update process
    - Create feedback loops
    - Track improvement effectiveness
    - Fan-out Aspect:
        - Customers
        - Suppliers

Preventive Measures:

1. Establish early warning systems
2. Strengthen quality control
3. Conduct risk assessments

    - Fan-out Aspect:
        - Product Line: PSY, Switch, ...

Lessons Learned Fan-out:



D8: Congratulate the Team

Following the successful resolution of the defect issue, we acknowledge the contributions of individuals and teams while encouraging a proactive approach to problem-solving in the future. We arranged a presentation to share the problem-solving process, outcome, and lessons learned with boarder organization. Finally, we reflect on the whole 8D process and discuss areas for improvement.

III. Customer Complaint Handling Flowchart